The University of Tennessee - Knoxville E&G

Presenters: Peter Reeves & Ditee Hossain

June 2nd, 2016
Who Partners with Sightlines?

Robust membership includes colleges, universities, consortiums and state systems

Serving the Nation’s Leading Institutions:

- 70% of the Top 20 Colleges*
- 75% of the Top 20 Universities*
- 34 Flagship State Universities
- 13 of the 14 Big 10 Institutions
- 9 of the 12 Ivy Plus Institutions
- 8 of 13 Selective Liberal Arts Colleges

* U.S. News Rankings

Sightlines is proud to announce that:

- 450 colleges and universities are Sightlines clients including over 325 ROPA members.
- 93% of ROPA members renewed in 2014
- We have clients in 42 states, the District of Columbia and four Canadian provinces
- More than 100 new institutions became Sightlines members since 2013

Sightlines advises state systems in:

- Alaska
- California
- Connecticut
- Hawaii
- Maine
- Massachusetts
- Minnesota
- Mississippi
- Missouri
- Nebraska
- New Hampshire
- New Jersey
- Pennsylvania
- Texas
- West Virginia
A Vocabulary for Measurement

The Return on Physical Assets – ROPA<sup>SM</sup>

The annual investment needed to ensure buildings will properly perform and reach their useful life

“Keep-Up Costs”

Annual Stewardship

The accumulation of repair and modernization needs and the definition of resource capacity to correct them

“Catch-Up Costs”

Asset Reinvestment

The effectiveness of the facilities operating budget, staffing, supervision, and energy management

Operational Effectiveness

The measure of service process, the maintenance quality of space and systems, and the customers opinion of service delivery

Service

Asset Value Change

Operations Success
## Peer Institutions

<table>
<thead>
<tr>
<th>Institution</th>
<th>Location</th>
</tr>
</thead>
<tbody>
<tr>
<td>Auburn University</td>
<td>Auburn, AL</td>
</tr>
<tr>
<td>Louisiana State University</td>
<td>Baton Rouge, LA</td>
</tr>
<tr>
<td>The University of Alabama (Tuscaloosa)</td>
<td>Tuscaloosa, AL</td>
</tr>
<tr>
<td>The University of Mississippi</td>
<td>Oxford, MS</td>
</tr>
<tr>
<td>University of Arkansas</td>
<td>Fayetteville, AR</td>
</tr>
<tr>
<td>University of Florida</td>
<td>Gainesville, FL</td>
</tr>
<tr>
<td>University of Georgia</td>
<td>Athens, GA</td>
</tr>
<tr>
<td>University of Kentucky</td>
<td>Lexington, KY</td>
</tr>
<tr>
<td>University of Missouri</td>
<td>Columbia, MO</td>
</tr>
</tbody>
</table>

**Comparative Considerations**

Size, technical complexity, region, geographic location, and setting are all factors included in the selection of peer institutions.
Putting Your Campus Building Age in Context

The campus age drives the overall risk profile

- **Pre-War**
  - Built before 1951
  - Durable construction
  - Older but typically lasts longer

- **Post-War**
  - Built from 1951 to 1975
  - Lower-quality construction
  - Already needing more repairs and renovations

- **Modern**
  - Built from 1976 to 1990
  - Quick-flash construction
  - Low-quality building components

- **Complex**
  - Built in 1991 and newer
  - Technically complex spaces
  - Higher-quality, more expensive to maintain & repair

The Sightlines Database- Construction Age chart shows the distribution of campus buildings by construction age. The chart indicates:

- **Pre-War**
  - Percent of Total Space 26%

- **Post-War**
  - Percent of Total Space 37%

- **Modern**
  - Percent of Total Space 10%

- **Complex**
  - Percent of Total Space 26%

The chart also shows the trend of campus buildings from 1880 to 2015, with a comparison line for "My Campus."
### Younger Campus Through Renovations

#### Square Footage by Construction Age

<table>
<thead>
<tr>
<th>Year</th>
<th>Space over 50</th>
<th>Space 25-50</th>
<th>Space 10-25</th>
<th>Space Under 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>5</td>
<td>14</td>
<td>18</td>
<td>20</td>
</tr>
<tr>
<td>2008</td>
<td>6</td>
<td>14</td>
<td>18</td>
<td>18</td>
</tr>
<tr>
<td>2009</td>
<td>8</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>2010</td>
<td>8</td>
<td>16</td>
<td>17</td>
<td>18</td>
</tr>
<tr>
<td>2011</td>
<td>7</td>
<td>11</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>2012</td>
<td>7</td>
<td>10</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>2013</td>
<td>13</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>2014</td>
<td>12</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
<tr>
<td>2015</td>
<td>14</td>
<td>14</td>
<td>14</td>
<td>14</td>
</tr>
</tbody>
</table>

#### Square Footage by Renovation Age

<table>
<thead>
<tr>
<th>Year</th>
<th>Space over 50</th>
<th>Space 25-50</th>
<th>Space 10-25</th>
<th>Space Under 10</th>
</tr>
</thead>
<tbody>
<tr>
<td>2007</td>
<td>14</td>
<td>27</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>2008</td>
<td>15</td>
<td>25</td>
<td>28</td>
<td>30</td>
</tr>
<tr>
<td>2009</td>
<td>18</td>
<td>25</td>
<td>25</td>
<td>32</td>
</tr>
<tr>
<td>2010</td>
<td>16</td>
<td>26</td>
<td>25</td>
<td>30</td>
</tr>
<tr>
<td>2011</td>
<td>17</td>
<td>26</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>2012</td>
<td>17</td>
<td>27</td>
<td>24</td>
<td>28</td>
</tr>
<tr>
<td>2013</td>
<td>14</td>
<td>28</td>
<td>28</td>
<td>28</td>
</tr>
<tr>
<td>2014</td>
<td>20</td>
<td>28</td>
<td>25</td>
<td>28</td>
</tr>
<tr>
<td>2015</td>
<td>20</td>
<td>25</td>
<td>28</td>
<td>25</td>
</tr>
</tbody>
</table>
Construction VS. Renovation Age

Space is younger today than it was 8 years ago

Construction Age
Renovation Age

UTK

Peer

Weighted age of a GSF

2007
2015

- 10 Years
- 13 Years

- 12 Years
- 13 Years
Total Capital Investment

Increased commitment to existing space in recent years

Total Capital Investment

$ in Millions


$0 $20 $40 $60 $80 $100 $120

- Existing Space Investment
- New Space Investment
- Non-Facilities
- Average
Total Project Spending vs. Peers

Higher investment levels, despite lower stewardship funding

Total AS & AR without Infrastructure

UTK

Peers

$/GSF


Total AS/GSF
Total AR/GSF
Avg
Defining an Annual Investment Target

Annual Funding Target: $29.8 M

FY15 Annual Investment Target

Replacement Value: $2.1B

Functional obsolescence drives investment prior to life cycles & discounts the annual investment target

3% Replacement Value: $62.8

Life Cycle Need: $32.1

Annual Investment Target: $11.2

- Envelope/Mechanical: $24.8
- Space/Program: $18.6
Total Capital Investment vs. Funding Target

- Increasing Net Asset Value
- Lowering Risk Profile
- Increasing Backlog & Risk

- Total Capital Investment vs. Funding Target
- Annual Stewardship
- Annual Investment Target
- Life Cycle Need

$0.0, $10.0, $20.0, $30.0, $40.0, $50.0, $60.0


Millions

The University of Tennessee
Knoxville
Facilities Services
Total Capital Investment vs. Funding Target

Meeting Target For Past 5 Years With One-Time Dollars

Total Capital Investment vs. Funding Target

- Increasing Net Asset Value
- Lowering Risk Profile
- Increasing Backlog & Risk

Does Not Include Infrastructure Spending
UTK Has Reduced It’s Backlog Through Investment

Backlog remains above peer levels

**Asset Reinvestment Need**

<table>
<thead>
<tr>
<th>Year</th>
<th>UTK</th>
<th>Peers</th>
</tr>
</thead>
<tbody>
<tr>
<td>2008</td>
<td>$120</td>
<td>$120</td>
</tr>
<tr>
<td>2009</td>
<td>$100</td>
<td>$120</td>
</tr>
<tr>
<td>2010</td>
<td>$80</td>
<td>$100</td>
</tr>
<tr>
<td>2011</td>
<td>$60</td>
<td>$80</td>
</tr>
<tr>
<td>2012</td>
<td>$40</td>
<td>$60</td>
</tr>
<tr>
<td>2013</td>
<td>$20</td>
<td>$40</td>
</tr>
<tr>
<td>2014</td>
<td>$0</td>
<td>$20</td>
</tr>
<tr>
<td>2015</td>
<td>$0</td>
<td>$0</td>
</tr>
</tbody>
</table>

- **UTK’s Backlog is Decreasing**
- **Peers Have Lower Overall AR Need**

2% decrease since 2008

14% increase since 2008
Total Project Spending by Package

Switch Focus of investments in the future?

Capital Investment Mix by Year

Total Investment Mix

- Envelope: 16%
- Building Systems: 23%
- Infrastructure: 31%
- Space Renewal: 26%
- Safety/Code: 4%
**Mod. & Infra. Need**
- Infrastructure & modernization
  - Sightlines estimate

**Renewal Need**
- What building needs will come due in the next 10 years?
  - Building Exteriors
  - Electrical
  - HVAC
  - Interiors
  - Plumbing
  - Roofing

**Current Need**
- What on campus is currently broken, operating at a significantly higher cost, or requires significantly more time to maintain?
Asset Reinvestment Need

<table>
<thead>
<tr>
<th>Total Dollars (Millions)</th>
<th>$108</th>
<th>$229</th>
<th>$240</th>
<th>$700</th>
</tr>
</thead>
</table>

Current Need Breakdown

- Small Building Renovation: 16%
- Roofing: 3%
- Electrical: 12%
- Plumbing: 15%
- Interiors: 29%
- HVAC: 16%
- Building Exteriors: 23%

Current Need

- $108
- $229
- $240

Renewal Need

- $0

Modernization & Infrastructure

- $0
ROPA+ Prediction: Predictive Investment Model

 Asset Reinvestment Need


g $108
17

Total Dollars (Millions)

$0
$100
$200
$300
$400
$500
$600
$700

Total Dollars (Millions)

$0
$10
$20
$30
$40
$50
$60
$70
$80

10 Year Capital Forecast

2016
2017
2018
2019
2020
2021
2022
2023
2024
2025

Current Need
Renewal Need
Modernization & Infrastructure
Operational Spending is Above Peer Average

Operating Actuals

$0.00 $1.00 $2.00 $3.00 $4.00 $5.00 $6.00 $7.00 $8.00 $9.00 $10.00
$/GSF


UTK

Utilities PM Daily Service

Operating Actuals

$0.00 $1.00 $2.00 $3.00 $4.00 $5.00 $6.00 $7.00 $8.00 $9.00 $10.00
$/GSF


Peers

Utilities PM Daily Service
Larger Buildings: Greater Economies of Scale

**Building Intensity**

**Definition** – Measurement of the number of buildings per million GSF

**Application** – Implications on the numbers if systems and travel time/economies of scale.
Increasing maintenance coverage (fewer staff) and supervision ratios (fewer supervisors).
Maintenance Performance

Fewer maintenance staff than peers, with higher supervision

Maintenance Staffing

Maintenance Supervision

Institutions arranged by Tech Rating
Density Factor near Peer Average

Density Factor

Definition - Total Faculty, Staff, & Students FTE per total campus GSF

Application – Illustrates the campus users’ impact on the wear and tear of facilities
In 2012, Custodial presents room for improvement

### Custodial Staffing

<table>
<thead>
<tr>
<th>GSF/FTE</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>UTK</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Custodial Supervision

<table>
<thead>
<tr>
<th>FTE/Super</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>UTK</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>I</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cleanliness</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Institutions arranged by Density Factor
Custodial Transition

*Increased custodial efficiency as custodial transition in-house*

**Coverage**

**Supervision**

FTE/Supervisor

- **In-House**
- **GCA**
- **Coverage**
Custodial Performance 2015

Custodial Metrics are in line with peers, producing better results

**Custodial Staffing**

- Institutions arranged by Density Factor

**Custodial Supervision**

- Institutions arranged by Density Factor

**Cleanliness**

- Institutions arranged by Density Factor
Qualifying Metrics - Grounds Intensity - Top 50 Publics

**Grounds Intensity**

**Definition** – Measurement of the number of buildings per Developed Acre

**Application** – Indicates the intricacy of the campus grounds and the intensity to maintain

![Diagram showing Grounds Intensity with two categories: More Intricate and More Open Space.](image)
Grounds Performance

Fewer Grounds workers compared to top public institutions

**Grounds Staffing**

**Grounds Supervision**

**Grounds Inspection Score**

Institutions arranged by Grounds Intensity
Comparing Service Levels and Costs

**Operating Actuals (DS & PM) $/GSF**
vs. peers and Inspection Scores*

Arrayed by Technical Complexity

*Inspection Score Index includes: Repair/Impression, Mechanical, Exterior, Cleanliness, and Grounds*
Comparing Service Levels and Costs

Operating Actuals $/GSF Per Inspection Percentage Point
UTK over time

Increasing Efficiency & Effectiveness

Operating Actuals $/GSF Per Inspection Percentage Point
Versus Peers

2012 2013 2015

$0.062 $0.052 $0.049

$0.057 $0.054 $0.049 $0.049 $0.049 $0.048 $0.049 $0.044 $0.059 $0.057

A B C D UTK E F G H I
Sustainability Solutions
Distribution of Emissions by Level of Control

**Scope 1 – Direct GHGs**
- Natural Gas, Fuel Oil
- Vehicle Fleet
- Refrigerants

**Scope 2 – Upstream GHGs**
- Purchased Electricity

**Scope 3 – Indirect GHGs**
- Faculty/Staff/Student Commuting
- Directly Financed Travel
- Study Abroad Travel
- Solid Waste
- Wastewater
- Paper Purchasing
- Transmission & Distribution Losses
Distribution of Emissions by Level of Control

**Emissions by Scope**

- **Scope 1**: 27%
- **Scope 2**: 50%
- **Scope 3**: 23%

---

**Scope 1 Sources**

- Other On-Campus Stationary
- Direct Transportation
- Refrigerants & Chemicals

**Scope 2 Sources**

- Purchased Electricity

**Scope 3 Sources**

- Commuting
- Wastewater
- Travel
- Paper Purchasing
- Scope 2 T&D Losses
Gross Emissions Increased against 2007 Baseline

Normalized Emissions Decreased

Change in Emissions vs. Change in Campus Size and Population
Indexed to FY2007

Change in Space, Population, and Emissions
Indexed to FY2007
Gross Emissions

Total Emissions vs. Space Growth

- Scope 1
- Scope 2
- Scope 3
- GSF
REC purchases significantly change net emission profile.
REC purchases significantly change net emission profile.
Energy Consumption vs. Peers

Lower consumption profile versus peer institutions

Total Utility Consumption By Fuel Type

<table>
<thead>
<tr>
<th>Year</th>
<th>UTK</th>
<th>Peers</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Electric</td>
<td>Fossil</td>
</tr>
<tr>
<td>2007</td>
<td>80,000</td>
<td>40,000</td>
</tr>
<tr>
<td>2008</td>
<td>76,000</td>
<td>34,000</td>
</tr>
<tr>
<td>2009</td>
<td>72,000</td>
<td>32,000</td>
</tr>
<tr>
<td>2010</td>
<td>68,000</td>
<td>30,000</td>
</tr>
<tr>
<td>2011</td>
<td>64,000</td>
<td>28,000</td>
</tr>
<tr>
<td>2012</td>
<td>60,000</td>
<td>26,000</td>
</tr>
<tr>
<td>2013</td>
<td>56,000</td>
<td>24,000</td>
</tr>
<tr>
<td>2014</td>
<td>52,000</td>
<td>22,000</td>
</tr>
<tr>
<td>2015</td>
<td>48,000</td>
<td>20,000</td>
</tr>
</tbody>
</table>
Questions and Comments